Indicative simplified baseline and monitoring methodologies
for selected small-scale CDM project activity categories

TYPE III - OTHER PROJECT ACTIVITIES

Project participants shall take into account the general guidance to the methodologies, information on additionality, abbreviations and general guidance on leakage provided at: <http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html>.

III.B. Switching fossil fuels

Technology/measure

1. This ~~category~~ methodology comprises fossil fuel switching in ~~existing~~[1] industrial, residential, commercial, institutional or electricity generation applications[2] (e.g. fuel switch from fuel oil to natural gas in an existing captive electricity generation, or replacement of a fuel oil boiler by a natural gas boiler).

2. Retrofit or replacement of existing installations are eligible under this methodology.

~~2.~~ 3. Fuel switching may also result in energy efficiency improvements ~~change efficiency as well~~. If the project activity primarily aims at reducing emissions through fuel switching, it falls into this ~~category~~ methodology. If fuel switching is part of a project activity focussed primarily on energy efficiency, the project activity falls ~~in~~ under ~~category~~ AMS II.D or II.E.

4. New facilities (Greenfield projects) and project activities involving capacity additions compared to the baseline scenario are only eligible to apply this methodology if they comply with the requirements in the General Guidance for SSC methodologies[3] concerning these topics. In addition the requirements for demonstration of the remaining lifetime of the equipment replaced as described in the general guidance shall be followed.

~~2.~~ 5. This ~~category~~ methodology is not applicable to project activities that propose switch from fossil fuel use in the baseline to renewable biomass, biofuel or renewable energy in the project scenario. A relevant type I methodology shall be used for such project activities that generate renewable energy displacing fossil fuel use. This methodology is also not applicable to project activities involving the use of waste gas; these project activities might be eligible under AMS III.Q.

6. In case of existing facilities historical information (detailed records) on the use of fossil fuels and the plant output (e.g. heat or electricity) in the baseline captive energy generation plant from at least 3 years prior to project implementation shall be used in the baseline calculations, e.g. information on coal use and heat output by a district heating plant, liquid fuel oil use and

[1] ~~This does not preclude project participants from proposing, in accordance with paragraphs 7 and 8 of the simplified modalities and procedures for small-scale CDM project activities, simplified baselines for switching of fossil fuels for new applications.~~

[2] Fuel switch in transportation technologies is not eligible under this methodology.

[3] Refer to: "Indicative simplified baseline and monitoring methodologies for selected small-scale CDM project activity categories".

electricity generated by a generating unit (records of fuel used and output can be used *in lieu* of actual collecting baseline validation data[4]). For facilities that are less than 3 years old, all historical data shall be available (a minimum of one year data would be required).

7. Multiple fossil fuel switching is not covered under this methodology.

~~3.~~ 8. Measures are limited to those that result in emission reductions of less than or equal to 60 kt CO_2 equivalent annually.

Boundary

~~4.~~ 9. The project boundary is the physical, geographical site where the fossil fuel switching takes place, and all installations affected by the switching.~~combustion affected by the fuel measure occurs.~~

Baseline

~~5.~~ 10. The emission baseline is the current emissions of the facility expressed as emissions per unit of output. ~~(e.g., kg CO_2e/kWh). Emission coefficients for the fuel used by the generating unit before and after the fuel switch are also needed. IPCC default values for emission coefficients may be used.~~ Baseline emissions shall be determined as follows:

$$BE_y = EF_{BSL} * Q_y \quad \textbf{(1)}$$

Where:

BE_y Baseline emissions in the project activity in year y (tCO_{2e})

EF_{BSL} Emission factor for the baseline situation (tCO_2/MWh)

Q_y Net output in the project activity in year y (MWh)

11. The net output in the project activity (Q_y) is limited to the installed capacity in the baseline situation, unless it has been demonstrated in accordance with paragraph 4 that the new installation (Greenfield project) or the added capacity has the same baseline scenario.

12. The emission factor in the baseline situation (EF_{BSL}) is the coefficient for the fossil fuel used in the baseline expressed as emissions per unit of output (e.g. kg CO_2e/kWh).

$$EF_{BSL} = (FC_{BSL} * EF_{CO2} * NCV) / Q_{BSL} \quad \textbf{(2)}$$

[4] In the case of coal, the emission coefficient shall be based on test results for periodic samples of the coal purchased if such tests are part of the normal practice for coal purchases.

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III.B. Switching fossil fuels (cont)

Where:

FC_{BSL}	Total amount of fossil fuel consumed for captive energy generation in the baseline situation in accordance with paragraph 6 (mass or volume unit)
EF_{CO2}	CO_2 emission factor for the baseline fossil fuel[5] (tCO_2/TJ)
NCV	Net calorific value for the baseline fossil fuel (TJ/ mass or volume unit)[5]
Q_{BSL}	Net energy generated in the captive plant in the baseline situation during the corresponding period of time for which the total fuel consumption was taken, in accordance with paragraph 6 (MWh)

Project Activity Emissions

~~6.~~ 13. Project activity emissions consist of those emissions related with the use of fossil fuel after the fuel switch~~. IPCC default values for emission coefficients may be used~~ Project emissions are determined as follows:

$$PE_y = FC_y * EF_{CO2} * NCV \quad \textbf{(3)}$$

Where:

PE_y	Project emissions in the project activity in year y (tCO_{2e})
FC_y	Amount of fossil fuel consumed for captive energy generation in the project activity in year y (mass or volume unit)
EF_{CO2}	CO_2 emission factor for fossil fuel (tCO_2/TJ)[5]
NCV	Net calorific value for the fossil fuel (TJ/ mass or volume unit)[5]

Leakage

~~7~~. 14. No leakage calculation is required.

Monitoring

15. The emission reduction achieved by the project activity will be calculated as the difference between the baseline emissions and the project emissions.

$$ER_y = BE_y - PE_y \quad \textbf{(4)}$$

Where:

ER_y	Emission reductions in the year y (tCO_2e)

[5] Reliable local or national data for the emission factor and NCV shall be used; IPCC default values should be used only when country or project specific data are not available or difficult to obtain.

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III.B. Switching fossil fuels (cont)

~~9.~~ 16. Monitoring shall ~~involve~~ include:

~~(a) Monitoring of the fuel use and output for an appropriate period (e.g., a few years, but records of fuel use may be used) prior to the fuel switch being implemented - e.g. coal use and heat output by a district heating plant, liquid fuel oil use and electricity generated by a generating unit (records of fuel used and output can be used *in lieu* of actual monitoring);~~

~~(b)~~ (a) Monitoring of the fossil fuel use (FC_y) and output after the project activity ~~fuel switch~~ has been implemented (Q_y) - e.g. gas use and heat output by a district heating plant, gas use and electricity generated by a generating unit.[6]

~~10. In the case of coal, the emission coefficient shall be based on test results for periodic samples of the coal purchased if such tests are part of the normal practice for coal purchases.~~

Project activity under a programme of activities

The following conditions apply for use of this methodology in a project activity under a programme of activities:

~~11.~~ 17. ~~In case the project activity involves fossil fuel switching measures,~~ L~~l~~eakage emissions resulting from fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of fossil fuels outside of the project boundary shall be considered, as per t~~T~~he guidance provided in the leakage section of ACM0009. ~~as in annex of this document shall be followed in this regard.~~ In case leakage emissions in the baseline situation is higher than leakage emissions in the project situation, leakage emissions will be set to zero.

~~In case the project activity involves the replacement of equipment, and the leakage effect of the use of the replaced equipment in another activity is neglected, because the replaced equipment is scrapped, an independent monitoring of scrapping of replaced equipment needs to be implemented The monitoring should include a check if the number of project activity equipment distributed by the project and the number of scrapped equipment correspond with each other. For this purpose, scrapped equipment should be stored until such correspondence has been checked. The scrapping of replaced equipment should be documented and independently verified.~~

[6] The necessary data are probably readily available, but may need to be organized into appropriate records and be supported by receipts for fuel purchases.

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III.B. Switching fossil fuels (cont)

~~Annex 1~~

~~(GUIDANCE ON LEAKAGE BELOW CONCERNS PROJECT ACTIVITY UNDER A PROGRAMME OF ACTIVITIES)~~

~~Leakage~~

~~Leakage may result from fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of fossil fuels outside of the project boundary. This includes mainly fugitive CH_4 emissions and CO_2 emissions from associated fuel combustion and flaring. In this methodology, the following leakage emission sources shall be considered:~~[7]

~~Fugitive CH_4 emissions associated with fuel extraction, processing, liquefaction, transportation, re-gasification and distribution of natural gas used in the project plant and fossil fuels used in the grid in the absence of the project activity.~~

~~In the case LNG is used in the project plant: CO_2 emissions from fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression into a natural gas transmission or distribution system.~~

~~Thus, leakage emissions are calculated as follows:~~

~~$$LE_y = LE_{CH4,y} + LE_{LNG,CO2,y} \quad (5)$$~~

~~Where:~~

~~LE_y~~	~~Leakage emissions during the year y in t CO_2e~~
~~$LE_{CH4,y}$~~	~~Leakage emissions due to fugitive upstream CH_4 emissions in the year y in t CO_2e~~
~~$LE_{LNG,CO2,y}$~~	~~Leakage emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system during the year y in t CO_2e~~

~~Note that to the extent that upstream emissions occur in Annex I countries that have ratified the Kyoto Protocol, from 1 January 2008 onwards, these emissions should be excluded, if technically possible, in the leakage calculations.~~

[7] The Meth Panel is undertaking further work on the estimation of leakage emission sources in case of fuel switch project activities. This approach may be revised based on outcome of this work.

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III.B. Switching fossil fuels (cont)

~~*Fugitive methane emissions*~~

~~For the purpose of determining fugitive methane emissions associated with the production – and in case of natural gas, the transportation and distribution of the fuels – project participants should multiply the quantity of natural gas consumed in all element processes *i* with a methane emission factor for these upstream emissions ($EF_{NG,upstream,CH4}$), and subtract for all fuel types *k* which would be used in the absence of the project activity the fuel quantities multiplied with respective methane emission factors ($EF_{k,upstream,CH4}$), as follows:~~

$$LE_{CH4,y} = \left[FF_{project,y} \cdot NCV_{NG,y} \cdot EF_{NG,upstream,CH4} - \sum_k FF_{baseline,k,y} \cdot NCV_k \cdot EF_{k,upstream,CH4} \right] \cdot GWP_{CH4} \quad (6)$$

~~With~~

$$FF_{project,y} = \sum_i FF_{project,i,y} \quad \text{and} \quad (7)$$

$$FF_{baseline,k,y} = \sum_i FF_{baseline,i,k,y} \quad (8)$$

~~Where:~~

~~$L_{CH4,y}$~~	~~Leakage emissions due to upstream fugitive CH_4 emissions in the year y in t CO_2e~~
~~$FF_{project,y}$~~	~~Quantity of natural gas combusted in all element processes during the year *y* in m^3~~
~~$FF_{project,i,y}$~~	~~Quantity of natural gas combusted in the element process *i* during the year *y* in m^3~~
~~$NCV_{NG,y}$~~	~~Average net calorific value of the natural gas combusted during the year *y* in MWh/m^3~~
~~$EF_{NG,upstream,CH4}$~~	~~Emission factor for upstream fugitive methane emissions from production, transportation and distribution of natural gas in t CH_4 per MWh fuel supplied to final consumers~~
~~$FF_{baseline,k,y}$~~	~~Quantity of fuel type *k* (a coal or petroleum fuel type) that would be combusted in the absence of the project activity in all element processes during the year *y* in a volume or mass unit~~
~~$FF_{baseline,i,k,y}$~~	~~Quantity of fuel type *k* (a coal or petroleum fuel type) that would be combusted~~

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III.B. Switching fossil fuels (cont)

	in the absence of the project activity in the element process *i* during the year *y* in a volume or mass unit
NCV_k	Average net calorific value of the fuel type *k* (a coal or petroleum fuel type) that would be combusted in the absence of the project activity during the year *y* in MWh per volume or mass unit
$EF_{k,upstream,CH4}$	Emission factor for upstream fugitive methane emissions from production of the fuel type k (a coal or petroleum fuel type) in t CH_4 per MWh fuel produced
GWP_{CH4}	Global warming potential of methane valid for the relevant commitment period

Where reliable and accurate national data on fugitive CH_4 emissions associated with the production, and in case of natural gas, the transportation and distribution of the fuels is available, project participants should use this data to determine average emission factors by dividing the total quantity of CH_4 emissions by the quantity of fuel produced or supplied respectively.[8] Where such data is not available, project participants may use the default values provided in Table 2 below. In this case, the natural gas emission factor for the location of the project should be used, except in cases where it can be shown that the relevant system element (gas production and/or processing/transmission/distribution) is predominantly of recent vintage and built and operated to international standards, in which case the US/Canada values may be used.

Note that the emission factor for fugitive upstream emissions for natural gas ($EF_{NG,upstream,CH4}$) should include fugitive emissions from production, processing, transport and distribution of natural gas, as indicated in the Table 2 below. Note further that in case of coal the emission factor is provided based on a mass unit and needs to be converted in an energy unit, taking into account the net calorific value of the coal.

Table 2: Default emission factors for fugitive CH_4 upstream emissions

[8] GHG inventory data reported to the UNFCCC as part of national communications can be used where country-specific approaches (and not IPCC Tier 1 default values) have been used to estimate emissions.

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III.B. Switching fossil fuels (cont)

Activity	Unit	Default emission factor	Reference for the underlying emission factor range in Volume 3 of the *1996 Revised IPCC Guidelines*
Coal			
Underground mining	t CH4 / kt coal	13.4	Equations 1 and 4, p. 1.105 and 1.110
Surface mining	t CH4 / kt coal	0.8	Equations 2 and 4, p.1.108 and 1.110
Oil			
Production	t CH4 / PJ	2.5	Tables 1-60 to 1-64, p. 1.129 - 1.131
Transport, refining and storage	t CH4 / PJ	1.6	Tables 1-60 to 1-64, p. 1.129 - 1.131
Total	t CH4 / PJ	4.1	
Natural gas			
USA and Canada			
Production	t CH4 / PJ	72	Table 1-60, p. 1.129
Processing, transport and distribution	t CH4 / PJ	88	Table 1-60, p. 1.129
Total	t CH4 / PJ	160	
Eastern Europe and former USSR			
Production	t CH4 / PJ	393	Table 1-61, p. 1.129
Processing, transport and distribution	t CH4 / PJ	528	Table 1-61, p. 1.129
Total	t CH4 / PJ	921	
Western Europe			
Production	t CH4 / PJ	21	Table 1-62, p. 1.130
Processing, transport and distribution	t CH4 / PJ	85	Table 1-62, p. 1.130
Total	t CH4 / PJ	105	
Other oil exporting countries / Rest of world			
Production	t CH4 / PJ	68	Table 1-63 and 1-64, p. 1.130 and 1.131
Processing, transport and distribution	t CH4 / PJ	228	Table 1-63 and 1-64, p. 1.130 and 1.131
Total	t CH4 / PJ	296	

Note: The emission factors in this table have been derived from IPCC default Tier 1 emission factors provided in Volume 3 of the 1996 IPCC Guidelines, by calculating the average of the provided default emission factor

~~*CO_2 emissions from LNG*~~

~~Where applicable, CO_2 emissions from fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system ($LE_{LNG,CO2,y}$) should be estimated by multiplying the quantity of natural gas combusted in the project with an appropriate emission factor, as follows:~~

~~$$LE_{LNG,CO2,y} = FF_{project,y} \cdot EF_{CO2,upstream,LNG} \quad (9)$$~~

~~Where:~~

~~$LE_{LNG,CO2,y}$~~	~~Leakage emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or~~

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III.B. Switching fossil fuels (cont)

	distribution system during the year y in t CO_2e
$FF_{project,y}$	Quantity of natural gas combusted in all element processes during the year *y* in m^3
$EF_{CO2,upstream,LNG}$	Emission factor for upstream CO_2 emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system

Where reliable and accurate data on upstream CO_2 emissions due to fossil fuel combustion / electricity consumption associated with the liquefaction, transportation, re-gasification and compression of LNG into a natural gas transmission or distribution system is available, project participants should use this data to determine an average emission factor. Where such data is not available, project participants may assume a default value of 6 t CO_2/TJ as a rough approximation.[9]

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[9] This value has been derived on data published for North American LNG systems. "Barclay, M. and N. Denton, 2005. Selecting offshore LNG process. <http://www.fwc.com/publications/tech_papers/files/LNJ091105p34-36.pdf> (10th April 2006)".